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WABASH VALLEY INTERSTATE COMMISSION

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Comprehensive River Basin Planning Wabash River Basin

The Wabash Valley Interstate Commission
414-416 Rea Building
Terre Haute, Indiana

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The Wabash Valley Interstate Commission has been assigned responsibility for planning for the optimum use of the human and natural resources of the Wabash Valley. This assignment is designated in the legislation which created the Commission.

The commentary here presented is an evaluation of the proposals for study of water and related land resources of this Valley by the various participating Federal Agencies. A critical review of these plans illustrates certain needs for supplementation if a truly comprehensive approach to basin planning is to be achieved. Recognition of the lack of authority in certain areas of resource development assists in identifying essential change in legislation at all levels of government to enable effective and efficient use of our environment.

The Commission appreciates the cooperation provided by all agencies concerned with resource development and presents this appraisal of the Plan of Survey in support of needed changes in the duties, responsibilities and authorities granted these agencies.

D. C. Pfendler

D. C. PFENDLER
Chairman

COMMENTS ON PLAN OF SURVEY

By

B. K. Barton
Executive Director

In proposing basic guide lines for a program to effect the best possible development, management, utilization and conservation of water and related land resources the Wabash Valley Interstate Commission accepts and adheres to the objectives of river basin planning as set forth in the statement of **Policies, Standards, and Procedures in the Formulation, Evaluation and Review of Plans for Use and Develompment of Water and Related Land Resources.**[1]

A. Development

National economic development, and development of each region within the country, is essential to the maintenance of National strength and the achievement of satisfactory levels of living. Water and related land resources development and management are essential to economic development and growth, through concurrent provision for:

— adequate supplies of surface and ground waters of suitable quality for domestic, municipal, agricultural, and industrial uses — including grazing, forestry, and mineral development uses.

— water quality facilities and controls to assure water of suitable quality for all purposes.

— water navigation facilities which provide a needed transportation service with advantage to the Nation's transportation system.

— hydroelectric power where its provision can contribute advantageously to a needed increase in power supply.

— flood control or prevention measures to protect people, property and productive lands from flood losses where such measures are justified and are the best means of avoiding flood damage.

— land stabilization measures where feasible to protect land and beaches for beneficial purposes.

— drainage measures, including salinity control where best use of land would be justifiably obtained.

— watershed protection and management measures where they will conserve and enhance resource use opportunities.

[1]This statement prepared by the Secretary of the Interior, the Secretary of Agriculture, The Secretary of Health, Education and Welfare and the Secretary of the Army was accepted by President Kennedy in May 1962 and approved for application by each of these Departments and the Bureau of the Budget.

— outdoor recreational and fish and wildlife opportunities where these can be provided or enhanced by development works

— any other means by which development of water and related land resources can contribute to economic growth and development.

B. **Preservation**

Proper stewardship in the long-term interest of the Nation's natural bounty requires in particular instances that:

— there be protection and rehabilitation of resources to insure availability for their best use when needed.

— open-space, green-space, and wild areas of rivers, lakes, beaches, mountains and related land areas be maintained and used for recreational purposes; and

— areas of unique natural beauty, historical and scientific interest be preserved and managed primarily for the inspiration, enjoyment and education of the people.

C. **Well Being of People**

Well being of all of the people shall be the over riding determinant in considering the best use of water and related land resources. Hardship and basic needs of particular groups within the general public shall be of concern, but care shall be taken to avoid resource use and development for the benefit of a few or the disadvantage of many. In particular, policy requirements and guides established by the Congress and aimed at assuring that the use of natural resources, including water resources, safeguard the interests of all of our people shall be observed.

Comprehensive river basin planning as illustrated in the Plan of Survey provided this Commission by the participating federal agencies might more accurately be identified as a master flood control program to which is added, if needed and if possible, certain utilitarian aspects of water development as secondary benefits from flood water control.

FEDERAL AGENCY PARTICIPATION

Although numerous federal agencies have become concerned with comprehensive river basin planning, the degree to which agency programs may attain truly comprehensive scope is limited by the authorization(s) under which the agency is given responsibility. The Corps of Engineers is authorized to study, plan, and construct projects relating to flood control, flood prevention and navigation. Water development, management, utilization and conservation for other purposes may be included in those projects selected for construction; such allied purposes are considered to be of secondary importance with flood water retention, protection from flooding and/or naviga-

tion as primary purposes for project accomplishment. These primary considerations affect the selection of possible reservoir sites, sites which may or may not be well suited for development purposes other than those for which the Corps has primary responsibility.

The Soil Conservation Service is likewise hampered in comprehensive river basin planning in that feasibility of projects for water control must be justifiable on the basis of alleviation of flood damages with other benefits identified as of secondary importance. Water supply needs, requirements of water for quality control, water development associated with recreational needs and other utilitarian phases of water development do not fall within the realm of responsibility of federal "construction agencies".

Thus "comprehensive planning" must be comprehensive within the rather well defined limits of agency responsibility and the truly comprehensive aspects of basin planning must be obtained through coordination and integration of the data acquired in various studies many of which must be accomplished by agencies other than those presently concerned.

An analysis of the **Plan of Survey, Wabash River Basin, Comprehensive Study on Development of the Water and Related Land Resources,** U. S. Army Engineer District, Louisville, Kentucky, (As revised November, 1964), including Supplements A through G, is provided to identify those facets of the study of water and related land resources presently under consideration and those not now included in the Plan of Survey.

I

Objective[2]—adequate supplies of surface and ground waters of suitable quality for domestic, municipal, agricultural and industrial uses — including grazing forestry and mineral development uses.

The Plan of Survey submitted by the Corps of Engineers (page 7 paragraph 6b) contains these statements.

> "Reservoirs under construction will be studied to determine their potential for meeting water supply storage needs, both by direct reservoir withdrawals or by supplementing low-flows". "Present indications are that some of the sites, screened by preliminary investigations from the framework plan of major reservoirs for flood control and other purposes, may be included in the Comprehensive Plan primarily or solely for water supply, for construction by non-Federal agencies".

Supplement A — Work Plan — U. S. Public Health Service contains these statements (page A-1-2 paragraph 3)

> "The PHS studies will determine present needs and estimate future needs for, and values of, storage for municipal and industrial water supply (except rural and agricultural) and for water

[2]Each of the ten (10) objectives listed on this and the following pages is quoted from the statement of **Policies, Standards, and Procedures in the Formulation, Evaluation and Review of Plans for Use and Development of Water and Related Land Resources** referred to on page one (1) of this report.

quality control that might be served by the reservoir projects under consideration. PHS will prepare estimates of quantity, location and time that water needs for municipal and industrial uses will be incurred and provide estimates of value of the water at the points of need. These estimates of value will reflect consideration of alternative water supply from ground water sources, when data furnished by U. S. G. S. indicates the feasibility of such sources of supply."

Supplement F — Work Plan — U. S. Geological Survey contains these statements (page F-1 and 2 paragraph 3)

"The U. S. Geological Survey studies will collect and provide data on the geologic framework as it relates to ground water aquifers for the area of existing or potential demands for water supply in relation to each project selected for survey scope study . . . . The studies will furnish analysis of potentials of the aquifers for water supply purposes . . . . . including consideration of recharge rates and recharge supply . . . . This information will be furnished to Public Health Service for its use in determination of comparative values of surface water and ground water supplies in respect to meeting the needs in the specific study areas for the projects under consideration".

Supplement A — Plan of Survey — U. S. Public Health Service, contains these further statements (page A-2 paragraph 4)

"It is assumed that about 40 reservoir sites will be involved throughout the study period in final screening for selection of projects for survey scope study. For such potential sites specifically designated by the Corps for preliminary study, PHS will provide preliminary information similar to, but of much less detailed definition than, the information provided for projects selected for detailed study covered under paragraph 3 above. Studies for the development of this preliminary information will be limited to the minimum necessary to determine whether there is existing or probable future need for water supply and/or water quality control . . . . The data may be furnished in written form or through conference discussions. It will consist of brief statements and specific quantities recommended for use by the Corps in preliminary project plan formulation and economic evaluation studies, ..."

Supplement F — Work Plan — U. S. Geological Survey contains these statements referring to general appraisal studies (page F-2 paragraph 5)

"The U. S. G. S. will provide qualitative and quantitative information, readily available at the time, to the Public Health Service on the locations, and the physical, hydraulic and quality characteristics of aquifers within the areas where the designated projects under consideration might serve water supply needs. Public Health Service will use this information for approximation of comparative surface water and ground water values as needed for general appraisal of the water supply potential in relation to area needs for the particular projects being considered in the Corps of Engineers screening process."

Supplement A — Work Plan — U. S. Public Health Service contains these statements referring to other areas of the Wabash Basin (pages A-2 and 3 paragraph 5)

> "In the later stages of the study, PHS will provide analyses of water supply and water quality needs in all other designated areas in the Basin, in addition to those covered under paragraphs 3 and 4, that are necessary for completion of water supply and water quality control considerations within the scope of the Comprehensive Basin Plan. The analyses for those remaining areas will be required primarily for the purpose of general appraisal of the long term future needs, and the resource development potentials to meet such needs for those portions of the Basin not covered by the investigations for projects for early development. The scope and nature of water supply and water quality control information on locations and approximate quantities of needs for those additional areas will be similar to that indicated under paragraph 4 . . . . Where information from the U. S. G. S. studies indicates potential feasibility of serving water supply needs from ground water sources, the information will include a qualitative discussion of the alternative ground water and surface water storage potentials, indicating the principal economic and other factors that should be considered in any future project plan development."

Supplement F — Work Plan — U. S. Geological Survey contains these statements.

> "U. S. Geological Survey will provide qualitative and quantitative information, to extent available on ground water aquifers in all other designated areas in the Basin, in addition to those covered under paragraphs 3, 4, and 5 above . . . . The information on these areas . . . . , will complete the required ground water data for the Basin Study . . . . "

Additional study of water needs will be accomplished through agencies of the U. S. Department of Agriculture.

Supplement D — Work Plan — U. S. Department of Agriculture contains these statements (page D-2 paragraph 4a, c and d)

> "Investigate the needs, potentials and feasibility of upstream watershed protection projects including the feasibility of single and multiple purpose reservoirs . . . . . "

> "Develop future irrigation and drainage requirements."

> "Appraise the livestock, rural domestic and forest-based industrial water requirements."

Water needs in mineral production and of mineral industries will be presented by the Bureau of Mines.

Supplement E — Work Plan — U. S. Bureau of Mines, (pages E-2, paragraph 4)

> The Bureau of Mines will furnish available information on demands and sources of water supply for existing minerals pro-

duction industry in each project area and estimates of water supply needs for the future minerals industry development projected for the area."

Comment:

Assuming the term "rural domestic" refers to non-farm as well as farm population and that studies by the Public Health Service will include all urban areas and, further assuming that the needs for water for mineral production are adequately reflected in the needs for industrial water; the study of water supply requirements, both present and projected, should provide as accurately as possible, the water needs and the location of these demand areas.

Identification of sources of supply for meeting these needs is not to be presented. Reference is made to the inclusion of water supply storage in proposed reservoir sites; these sites are to be selected on the basis of suitability for development as flood control reservoirs with water supply provided, if needed. It is anticipated that only "about 20 sites are expected to warrant full survey scope analysis[3]"; thus only about 20 localities in the entire basin may expect to obtain water from these reservoirs; "some sites" eliminated from further consideration after preliminary investigation may be available for non-federal development. No reservoir studies are planned which would identify potential impoundments for use primarily as sources of water supply.

The Soil Conservation Service River Basin studies are to include the identification of all possible reservoir sites in upstream areas and an analysis of the storage potential of all sites whether or not they are feasible to develop under Public Law 566. This will provide data on water impoundment potential for smaller volumes of water in sites not generally located near urban centers.

Data provided by the U. S. Geological Survey on acquifer location, yield, quality, etc., of water for water supply will be limited to those acquifers presently known. No new sources of ground water supply will be investigated.

Fortunately the Indiana Department of Conservation in cooperation with the U. S. Geological Survey is publishing reports on ground water resources of each county in the state, 26 such reports are now available; this Department is also planning a series of publications on the water resources of each county with emphasis on ground-water availability. This Commission voted to support the Department in its request for funds from the 94th Indiana General Assembly to finance the preparation and publication of this latter series. Similar reports should be prepared for those Illinois counties lying within the Wabash Valley.

II

Objective - water quality facilities and controls to assure water of suitable quality for all purposes,

Reference is made to water quality in the Plan of Survey, Corps of Engineers, page 7 paragraph 6c.

[3]Plan of Survey, Wabash River Basin, Comprehensive Study on Development of the Water and Related Land Resources, U. S. Army Engineer District, Louisville, Corps of Engineers, Rev. November 1964, P. 6 & 6 (a).

"Presently available information does not indicate existing widespread need for general water quality improvement of streams in the basin, although there are some local areas where pollution from mine wastes and drainage, domestic sewage, and industrial water already constitute a serious problem. The magnitude and extent of future needs for water quality control storage remain to be determined by Public Health Service and State agency investigations . . . . . "

Supplement A — Work Plan — U. S. Public Health Service contains these statements, (page A-1, 2, paragraphs 3, 4, and 5)

"The PHS studies will determine present needs and estimate future needs . . . . for water quality control that might be served by the reservoir projects under consideration . . . . PHS will also prepare estimates of quantity, quality, location and time when waste waters will be returned to the stream, to determine the gross pollution load on the stream. In addition, PHS will estimate requirements for maximum feasible waste removal and efficient treatment . . . . . to meet water quality needs for prospective water uses of the stream, and will establish the water quality goals by specific location on the stream and by quantitative criteria for the prospective water uses. PHS will compute flow regulations required from the proposed reservoir project to meet the established downstream water quality goals. . . ."

"For such potential sites specifically designated by the Corps for preliminary study, PHS will provide preliminary information similar to . . . . the information provided for projects . . . . under paragraph 3 above."

"In the later stages of the study, PHS will provide analyses of . . . . water quality needs in all other designated areas in the Basin . . . . that are necessary for completion of water supply and water quality control considerations within the scope of the Comprehensive Basin Plan."

Supplement D — Work Plan — U. S. Department of Agriculture contains this reference to water quality control, (page D-2, paragraph 4h)

"In connection with wood processing industries, USDA will in cooperation with PHS furnish information for evaluation of needs for water supply, waste treatment and water storages for control of net pollution loads."

Supplement E — Work Plan — U. S. Bureau of Mines contains this statement (page E-2 paragraph 4)

" . . . . The Bureau (of Mines) also will furnish available information on the nature, quantity and locations of drainage and other wastes affecting streams in the project area, from the existing minerals industry and will furnish estimates of these same factors for the projected future minerals industry development in the area. This information will include any available data on existing or planned drainage and waste control or treatment measures at the source for the existing industry. . . . . "

Supplement E — Work Plan — U. S. Geological Survey contains this reference to pollution of ground water sources, (page F-2 paragraph 3)

" . . . . . and the delineation of areas and degree of contamination from saline aquifers, oil field brines and acid mine wastes, ... "

Comment:

The U. S. Public Health Service will provide a report, quite comprehensive in scope, on the quality of water as affected by industrial, domestic and other wastes contributed by urban areas. Omission of the contribution of wastes to streams and ground water sources from rural and agricultural areas presents an unmistakable void in the pattern of "comprehensive study" for water quality control.

The request submitted by this Commission to the Secretary of the Department of Health, Education and Welfare asking that a study be made to determine the extent to which mine wastes and oil field wastes are contaminating the surface and sub-surface waters of the Wabash Basin should sufficiently supplement the work to be done in this area by the U. S. Bureau of Mines, and the Public Health Service.

Control of pollution in the States of Illinois and Indiana is quite effective, the greatest need is additional staff for policing action; many instances of pollution are unreported, once reported corrective action is usually obtained. Greater efficiency in pollution control might be accomplished in Illinois if responsibility for such control were centered entirely in the Sanitary Water Board rather than being divided between this Board and the Department of Mines and Minerals.

III

Objective - water navigation facilities which provide a needed transportation service with advantage to the Nation's transportation system.

Plan of Survey, Corps of Engineers, (page 8 paragraph 6-f)

"The navigation potential of the Wabash River from Terre Haute to the mouth will be studied initially to determine whether prospective economic justification is such as to warrant a survey scope investigation . . . . Possible further navigation investigations extending above Terre Haute will be dependent on the findings of the above-noted studies . . . . .

Comment:

This Commission published an abstract of a thesis[4] entitled, **The Transportation Structure of the Lower Wabash Valley,**[5] a study of freight flow patterns of this valley made by Dr. Armin K. Ludwig. The study illustrates a freight flow through the Valley from the Ohio River to the Great Lakes, any study of a potential navigation channel must recognize this basic movement. There is little expectation that a study of a portion of such a freight lane could illustrate

[4]Doctoral dissertation directed by the Department of Geography, University of Illinois, Urbana.

[5]Ludwig, Armin K., The Transportation Structure of the Lower Wabash Valley, The Wabash Valley Interstate Commission, Terre Haute, Indiana 1962

significantly the feasibility of a project extending the full distance of the existing freight flow.

The Commission has proposed an economic impact study to determine not only potential use of a competitive freight carrier but the total regional impact of a navigable waterway. This study to determine whether or not water transportation is economically desirable must be completed before additional studies of engineering feasibility are undertaken. The Commissions' proposal would concern the proposed development of a navigable waterways connecting the Ohio River with Lake Erie through a navigable Wabash-Maumee River System with a channel connecting Lake Michigan with the Wabash in the vicinity of Lafayette.

The objectives of a study to determine the impact of such an improvement on the economy are:

1. Determination of the net changes in transportation costs resulting from construction of the waterway and the effect of these rate changes upon the movements of commodities.
2. Estimation of changes in the value of resources, the possible devaluation of certain resources, enhancement of the value of others and the potential for the development of new and presently unused resources.
3. Determination of possible development of terminal facilities and the growth of new industry associated with trans-shipment points and bulk breaking points for low-cost bulky barge freight.
4. Estimation of new industries likely to develop as a result of available water transported commodities and an adequate and dependable supply of water.
5. Estimation of the beneficial effects on other forms of transportation as well as an estimate of the potential losses to other transportation media with an evaluation of the net result of such changes.
6. Estimation of changes in employment opportunities and in living standards possible only by using the proposed waterway.
7. Estimation of changes in land values and in total taxable wealth attributable to a completed waterway.
8. Presentation of both the value of a completed waterway and the adverse impact on the present economic structure of the Valley.

IV

Objective - hydroelectric power where its provision can contribute advantageously to a needed increase in power supply.

Plan of Survey - Corps of Engineers, (page 8 paragraph 6e)

"The hydroelectric power potential within the Wabash Basin is not considered to be great. However, consideration will be given

to the possible development of this potential in reservoir sites which are selected for inclusion in the Comprehensive Plan."

Comment:

A privately financed study of the potential for power development in existing and presently authorized Corps of Engineers' reservoirs in the Wabash Basin considered reservoir operation, dependable capability, energy production, project costs and power production costs. "It was found that none of the projects had any significant dependable capacity without modification of the operational rules designed for the primary purpose of the reservoir, that is, flood control. If such modifications were made additional expenditures would be required to compensate for the reduced flood control benefits. On the basis that the power would not be dependable, costs must be considered on the basis of fuel replacement energy costs from other dependable sources. On this basis all the projects showed a much higher cost than that available from coal fired plants.[6]"

V

Objective - flood control or prevention measures to protect people, property and productive lands from flood losses where such measures are justified and are the best means of avoiding flood damage.

Plan of Survey, Corps of Engineers (page 6 and 7, paragraph 6a)

"Extensive and recurrent flood damage has been, is now and probably will remain the most dominant single problem related to water resources throughout the basin. The problem exists generally along the entire length of the mainstems of the Wabash and White Rivers and along the greater portions of nearly all their tributaries, affecting a considerable number of urban areas, a vast extent of highly developed agricultural lands and a broad network of roads and highways . . . . much has been done and more is underway, by reservoirs and levees for agricultural and urban areas, for alleviation of flood damages. While the benefits from these works are great, they satisfy only a fraction of the total need . . . . . the optimum plan for comprehensive development undoubtedly will still fall very short of meeting the over-all need. . . . . our plan of survey contemplates preliminary investigation of about 200 additional reservoir potentials, with a reasonable prospect of about 40 sites being found to merit more detailed study, of which about 20 sites are expected to warrant full survey scope analysis. About 40 additional potential local improvement projects . . . . . will receive preliminary investigation, of which about 16 are expected to merit full survey scope planning and analysis. For headwater agricultural areas, The Plan contemplates investigations by the Soil Conservation Service for small watershed type development potentials." On pages 9 and 10 paragraph 6h is the following; "Coordinated studies with the Department of Agriculture will be made with a

[6]Letter directed to the Wabash Valley Interstate Commission from Public Service Indiana, dated March 1, 1965.

view to developing plans for waterflow retardation and soil conservation in headwater areas . . . . ." The studies for headwater improvement will include evaluation of economics and physical effect of proposed projects for consideration as alternative or supplemental measures to downstream projects, so that the best overall plans of development may be established."

The Soil Conservation Service River Basins study will, as indicated in Supplement D — Work Plan — U. S. Department of Agriculture, (page D-2, paragraph 4a, e, f)

"Investigate the needs, potentials and feasibility of upstream watershed protection projects including the feasibility of single and multiple-purpose reservoirs, channel improvements, land treatment measures and other related soil and water conservation measures in upstream areas."

"Identify those elements of water management and control systems, and associated land treatment measures required to satisfy immediate needs (10-15 years) and those projects to be recommended for authorization."

"USDA will make available, to the extent feasible as its studies progress, data and information on the needs and potentials for overall watershed development projects in sub-basins that would affect, or be affected by works of improvement considered by other agencies. Projects to be recommended for authorization will be considered jointly by the USDA and the Corps to achieve compatibility in meeting overall needs."

Comment:

Flood control studies and project accomplishment in this area by the Corps of Engineers and the Soil Conservation Service will enable significant reduction in flood damages on bottomland areas throughout the Basin. Present studies will result in a plan for flood control and flood prevention; it may not be the only such plan possible nor even the most effective flood control plan since there is to be no study of alternative plans except as the preliminary study of reservoir sites for the screening process might be construed to be consideration of an alternative. Combining Soil Conservation Service and Corps recommendations in a particular sub-basin may or may not result in alternative proposals for that sub-basin.

There is to be no consideration of an alternative proposal for development to satisfy water needs, including flood control, of the sub-basin, the region or the Wabash Valley.

It is necessary that the Division of Waterways in Illinois and the Indiana Flood Control and Water Resources Commission carefully evaluate the proposed projects of the Corps of Engineers and Soil Conservation Service prior to the preparation of an Interim Report on such projects to determine whether or not these proposals are compatible with the plan for water development in the particular state and whether or not the proposals are compatible with the potential for maximum development of the water resource of the particular sub-basin.

Objective - land stabilization measures where feasible to protect land and beaches for beneficial purposes.

In the Corps of Engineers, Plan of Survey are references to this need: (page 9 paragraph 6h)

> "Recently developed methods of farming, including improved land conservation measures, have aided in preserving valuable farmland adjacent to streams and rivers. Coordinated studies with the Department of Agriculture will be made . . . . . These studies will utilize sedimentation data from Soil Conservation Service and U. S. Geological Survey . . . . . to estimate sediment accumulation in basins where reservoirs are considered, by the Corps and other agencies, to evaluate damages from sediment deposition, and to evaluate the effectiveness of prospective land treatment measures."

Supplement D — Work Plan — U. S. Department of Agriculture contains these statements: (page D-2 paragraphs 4a and f)

> "Investigate the needs, potentials and feasibility of upstream watershed protection projects including the feasibility of single and multiple-purpose reservoirs, channel improvements, land treatment measures and other related soil and water conservation measures in upstream areas."

> "Identify those elements of water management and control systems, and associated land treatment measures required to satisfy immediate needs . . . . . and those projects to be recommended for authorization."

Supplement D, (page D-4 paragraph 11)

> "Sedimentation data developed by USDA or obtained from USGS and other sources in connection with USDA upstream watershed projects investigations will be furnished to the Corps, along with any comments with views USDA may have on general evaluation of sedimentation aspects. The Corps will likewise be furnished evaluations of effects of the contemplated upstream watershed projects on sedimentation."

Comment:

Land stabilization through upstream watershed projects must be accomplished through local action by citizen groups under the sponsorship of local Soil and Water Conservation Districts. The small watershed program under Public Law 566 requires local financing of all costs except actual construction costs of flood control structures and cost sharing on rural water supply, recreational and fish and wildlife conservation aspects of project development. Certain cost sharing on land treatment measures is available through the Agricultural Stabilization and Conservation Service. Technical assistance is available to farm land owners for land stabilization work through the Soil Conservation Service, the U. S. Forest Service and the State Foresters of the Illinois and Indiana Departments of Conservation. Progress in land

stabilization work in the Wabash Basin is being made but accomplishment in this work must be accelerated.

Both states, Indiana and Illinois, have appropriated funds to employ an additional watershed planning party in each state yet the work of initiating interest in watershed development is left entirely in the hands of local Soil and Water Conservation District Boards, comprised of five local farmers who have only meager funds available to them for operation of the District.

It is suggested that State agencies, the Illinois Department of Agriculture and the State Soil Conservation Committee in Indiana, take a more active part in the local promotion of these much needed watershed projects.

Land stabilization in areas tributary to reservoir projects developed by the Corps of Engineers must be accomplished to prolong the effective life of these reservoirs. Under the present concept of use of flood control reservoirs this is not a factor, the so-called "conservation pool" is designed to accumulate sediment at an anticipated rate and at the time this conservation pool becomes a mud flat the flood controil features of the reservoir are still equally effective. For this reason, no economic benefits for upstream sedimentation control can be claimed. This plus the inundation of farmland by the reservoir frequently makes it impossible to economically justify watershed protection projects on these tributary streams since the benefit area has been removed from agricultural usage. It is essential that this facet of the small watershed program be changed to permit control of all lands contributing water to reservoirs regardless of the purpose for which the reservoir may have been constructed.

Although it may be impractical where extensive drainage areas are concerned, wherever possible, project areas of reservoir projects should include all unstable and silt contributing areas draining into the project and stabilization structures and land treatment measures on these areas should be an initial phase of project development.

VII

Objective - drainage measures, including salinity control where best use of the land would be justifiably obtained.

The Corps of Engineers Plan of Survey contains this reference to drainage (page 10 paragraph 6i)

> "Improvement of drainage will be considered, since many areas within the basin have reported flood problems which result from inadequate drainage. Drainage will also be considered in areas where studies by the Department of Agriculture indicate the work and feasibility of increasing land productivity by this means."

Supplement D — Work Plan — U. S. Department of Agriculture refers to drainage in paragraph 4c on page D-2.

> "Develop future irrigation and drainage requirements."

Comment:

The drainage of agricultural lands where efficiently and effectively accomplished has generally produced significant returns in more dependable and increased agricultural production. Until recently, this work has been considered entirely the responsibility of the landowner and has been financed by direct contribution from the land benefitted. Recently federal agricultural programs have provided cost-sharing on drainage projects of benefit to agricultural areas.

Because the landowner has certain inherent rights in the use of his land there should be no attempt to restrict the construction of drainage projects designed to improve the removal of excess water on lands on which artificial drainage has already been established and on which improvement of the drainage system will provide increased crop yields.

However, in view of the capacity of agriculturalists to obtain production in excess of the demand for agricultural products and of the demand for "wet" lands for wildlife habitat development and other recreational uses, the creation of newly productive lands through drainage should be permitted only after it is determined that the Department of Conservation in the respective state and/or the U. S. Fish and Wildlife Service has no interest in acquiring use of these "wet" lands.

The potential for development of drainage on agricultural lands is, of course, limited by both economic and physical factors. Those lands on which physical factors are a limiting influence will be identified at the time of completion of the U. S. Department of Agriculture study of upstream areas and at this time possible other use of these lands can be planned. Those lands on which economic factors are a limiting influence will be considered under a progressive program of drainage improvement based upon anticipated economic change which will permit profitable project development.

VIII

Objective - watershed protection and management measures where they will conserve and enhance resource use opportunities.

The U. S. Department of Agriculture is now studying 540 small hydrologic units lying within the Wabash Valley.

The purposes for studying these units are outlined in Supplement D — Work Plan — U. S. Department of Agriculture (page D-2 paragraph 4a-h inclusive)

"Investigate the needs, potentials and feasibility of upstream watershed protection projects including the feasibility of single and multiple-purpose reservoirs, channel improvements, land treatment measures and other related soil and water conservation measures in upstream areas."

"Develop estimates of present and future needs and values for agricultural and forest production that might be satisfied by the development of basin water and related land resources."

"Develop future irrigation and drainage requirements."

"Appraise the livestock, rural domestic and forest-based industrial water requirements."

"Identify those elements of water management and control systems, and associated land treatment measures required to satisfy immediate needs (10-15 years) and those projects to be recommended for authorization."

"USDA will make available, to the extent feasible, as its studies progress, data and information on the needs and potentials for overall watershed development projects in sub-basins that would affect, or be affected by works of improvement considered by other agencies. Those watershed development projects determined to be feasible, needed, or justified for early development (10-15 years), will be included in the comprehensive report for the basin, if pertinent data are obtained in time, recommendations for authorizations of needed watershed projects will be included in appropriate Interim Reports of the Basin Study. Projects to be recommended for authorization will be considered jointly by the USDA and the Corps to achieve compatability in meeting overall needs."

"USDA through the Forest Service will develop present and future forest land treatment needs, provide data on production and management levels and be responsible for determining impacts of proposals upon the administration of the National Forests."

"In connection with wood processing industries, USDA will in cooperation with PHS furnish information for evaluation of needs for water supply, waste treatment and water storages for control of net pollution loads. This will involve coordination by both FS and PHS with Economic Base Survey projections."

Comment:

Although the study of watersheds by Soil Conservation Service with the other agencies apparently will provide a rather complete study of upstream areas, the implementation of watershed project development in such a manner as to make full use of the potential in each area depends upon some basic changes in developmental procedure.

To re-iterate certain concern over the procedures which must be followed in watershed project development; expansion of the federally recognized purposes for watershed development has not been accompanied with provision for technical assistance other than in the field of soil and agricultural water management. Thus new phases of development are available to residents of watershed project areas but trained personnel are not readily available to assist in non-agricultural development and initial interest in non-agricultural phases of this work is left entirely to chance. Some agency must assume the responsibility for interpreting for local groups the opportunities for development which are present in local watershed areas.

Water quality control is indicated as a major objective in river

basin planning yet there is no provision for this aspect of water conservation in the small watershed program.

Even though recreation benefits can be used in determining the benefit-cost ratio of watershed projects, these benefits can be added to the project only after it is determined that the flood damage reduction benefits are sufficient to present a favorable or at least near favorable benefit-cost ratio. Thus the watershed program is basically justifiable only on the value of flood control and offers no opportunity for upstream development without specific benefit to a flood damage area.

IX

Objective - outdoor recreational and fish and wildlife opportunities where these can be provided or enhanced by development works.

The Plan of Survey, Corps of Engineers refers to recreation (on page 8 paragraph 6d)

> "Except for a few Corps of Engineers' reservoirs completed or under construction, the Basin is almost entirely devoid of facilities for water-based recreation. Natural lakes are non-existent and the natural streams provide little opportunity for such recreation. . . . . All Corps of Engineers existing, under construction and recommended reservoirs to date provide for development of this resource to the maximum extent compatible with other purposes . . . . . It is expected that full feasible development of the potentials for this purpose in all the major reservoirs developed in the Comprehensive Plan will not completely satisfy future needs . . . . . "

Supplement D — Work Plan — U. S. Department of Agriculture contains this statement in paragraph 7 page D-3.

> "Fish and wildlife and water-oriented recreation will be studied in connection with upstream watershed project investigations and overall results will be correlated with the Corps Survey Scope Studies."

Supplement B — U. S. Fish and Wildlife Service Work Plan contains these statements (pages B-1 and B-2, paragraphs 3 & 4)

> "A complete appraisal by BSF and W of the existing fish and wildlife resources of each area to be influenced by a project will be made. This will include compilation and analysis of estimated needs . . . . . Factors limiting abundance and utilization will also be discussed . . . . as will the importance of the project area in providing for the present and future needs of the local, regional or Basin hunter and fisherman. Both beneficial and detrimental effects of the project on the existing fish and game resources will then be described in detail; . . . . . A systematic plan for fish and wildlife development on or adjacent to each project area will be produced . . . ."

> "A study of existing Corps projects in regard to fish and wildlife resources will offer BSF and W an opportunity to determine

(1) Indices of fishing and sport boating pressures; (2) Information on reservoir environment, . . . (3) Information on the effects of drawdown (from seasonal pool to permanent pool) on angling quality and utilization; (4) Information on the effects of siltation turbidity and management of procedures on an "aging" versus "new" reservoir (5) Information concerning utilization of project lands and waters. Special studies in regard to fish and wildlife involving analyses of interstate projects and existing resources on the Wabash River Basin will include the following: (1) Analyses and evaluation of Wabash Basin comprehensive levee system; (2) Analyses of stratified hunter use patterns on reservoir lands; (3) Studies of tailwater fisheries at existing reservoirs; (4) Sources of hunting and fishing pressures (geographical); (5) Special studies as to effect of timber plot size and hunter utilization; (6) Special stream inventory in Indiana; (7) Special waterfowl habitat inventory in Illinois; (8) Study of hunting pressure on managed reservoir land compared to unmanaged reservoir lands."

In paragraph 6 page B-3 the following is stated:

"Bureau of Sport Fisheries and Wildlife will provide an appraisal of existing fish and wildlife resources in other areas in the Basin . . . . as required for completion of fish and wildlife considerations within the scope of the Comprehensive Basin Plan. The scope and nature of fish and wildlife information for these additional areas will be . . . . . for general appraisal of fish and wildlife resources . . . . . "

Supplement C — Work Plan — Bureau of Outdoor Recreation contains these specific references (page C-1 and C-2, paragraphs 3, 4, and 5)

"The Bureau of Outdoor Recreation will make a complete appraisal of existing outdoor recreation resources for each project area selected for survey scope study. For each designated area, an evaluation will be made of the road networks and road improvement plans and other factors pertinent to evaluation of the potential sites for recreational development and use . . . . . Present recreational needs and demands for each project selected for survey scope study will be determined by use of current population, economic, and other data which are applicable within the sphere of influence. Future recreation needs and demands for each project studied will be determined by application of projection indices . . . . "

"It is assumed that about 40 reservoir sites will be involved throughout the study period in final screening for selection of projects for survey scope study. These sites will be appraised as to the quality of outdoor recreation resources. The appraisals will be limited to brief description of the basic resource potentials at each site and listing of known limiting factors, attractive resources, and potential for fulfilling outdoor recreation needs expressed in context with potentials of other reservoir sites considered . . . . . "

"Bureau of Outdoor Recreation will provide an appraisal of exist-

ing recreation resources in all other areas in the Basin, ... as required for completion of outdoor recreation considerations within the scope of the Comprehensive Basin Plan. . . . . ."

Comment:

Project development both in upstream watershed areas and in areas identified for construction of reservoirs by the Corps of Engineers will be studied and plans prepared for development of water-oriented recreation. No consideration is given non-water associated recreational development other than the identification of hunting pressures and certain specific special studies of hunter use of habitat areas.

Within this valley live thousands of persons who are interested in driving for pleasure, hiking, camping, sightseeing, picnicking, bicycling, horseback riding, participating in outdoor sports, walking on nature trails, collecting fossils and rocks and many other types of outdoor recreation which need have no association with water. In this plan of survey no consideration is given provision of land areas to satisfy these needs.

Under the present study it is assumed that all who are outdoor recreation participants both among the residents of the Basin and the visitors from adjacent areas will concentrate on approximately 20 locations within these 33,000 square miles.

Fortunately, the Land and Water Conservation Fund Bill, under which federal funds are available to the states for acquisition of land and for development of recreational facilities, requires the preparation of a state recreation plan. State plans for Illinois and Indiana recognizing all needs and local, regional and state wide demands, must be considered as guides in determining the recreational development proposals for small watershed and Corps project recommendations; likewise state plans should be so drawn as to include the advantages for, recreational facility development offered by projects developed under these programs.

X

Objective—any other means by which development of water and related land resources can contribute to economic growth and development.

Comment:

Significantly, although this statement is the usual terminating phraseology in any series of statements, it may be interpreted as indicative of the intent of the Executive Branch of the Federal Government that river basin planning should be accomplished in the most comprehensive manner possible.

A second section of the Policy Statement under the general heading, **Objectives,** concerns preservation; within the Plan of Survey there is no provision for preservation as presented in this section. Preservation as stated provides that open-space, green-space and wild areas of rivers, lakes, beaches, mountains and related land areas be maintained and used for recreational purposes; and, areas of unique natural beauty, historical and scientific interest be preserved and managed primarily for the inspiration, enjoyment and education of the people.

Historic sites, scenic rock formations, areas of unique vegetation, wildlife refuges, etc., must be identified and, if determined to be significant, preservation must be accomplished; further, where applicable, management practices should be applied to enhance the value of the area.

Preservation and rehabilitation of resources to insure availability for their best use when needed is also set forth as an objective of river basin planning. Such a connotation of the term preservation provides innumerable opportunities for protection of resource areas. Particularly critical in the Wabash Valley is the relatively small number of potential reservoir sites especially in those sub-areas which have shown the greatest urban development. Many potential sites are now occupied by residential developments, railroads, highways and other cultural improvements which nullify the possibility of reservoir development or materially increase the cost of creating water storage. Identification of potential sites accompanied by a program of insuring preservation of the site at least in its present state of development will assure the availability of many of these storage areas when, at some future date, development is required.

Finally, in the objectives of river basin planning for the development of water and related land resources is the statement that the overriding determinant in considering the best use of these resources shall be the well-being of all people. This, it seems, requires consideration of the different uses of resources to determine whether or not some are more basic than others for the well-being of the people of a region; examination of development and management methods to determine whether or not development for one use is compatible with development for other uses and, if not compatible, what benefits are to be sacrificed in the development program. Further, responsibility for development for the well-being of all people requires first that we identify who and where are "all people". This Commission has been given the responsibility of planning resources development in the Wabash Valley to promote economic growth within this valley, presumably it has primary responsibility to the people living within the limits of this valley.

EVALUATION

Evaluation of the plan of survey requires certain assumptions be made upon which evaluating judgments can be based.

Assuming this regional responsibility, noted above, designation of the relative importance of each of the various uses of water becomes important in judging the merits of water development programs and projects. Thus, if we assume water supply needs are most basic in a development program it then becomes necessary to determine those needs and the means for supplying those needs before plans for other facets of a water development program are finalized.

In an area such as the Wabash Basin the relative importance of the different water uses will vary from locale to locale and intra-basin conflicts may arise which must be resolved through inter-basin trans-

fer of water. Although not now legally possible, in this Basin, it may be assumed that, economically and physically, transfer of water from one area of the Basin to another need not be considered a significant factor in development.

The demand for water to supply the domestic and industrial needs of both rural and urban populations will be identified by the U. S. Public Health Service and the Soil Conservation Service. The Public Health Service will likewise identify the water needs to insure water of desirable quality assuming adequate treatment of waste prior to introduction into the surface waters of the Basin. Provision of storage capacity to meet these needs under the presently anticipated plan will be possible only in some 20 locations, those sites expected to be designated by the Corps of Engineers for reservoir construction; sites selected as most desirable for flood control. Storage of water for low-flow augmentation and for water supply is provided only if the site selected should by chance be located in a portion of the Valley where water supply and water for quality control are needed. Provision of water for these purposes in small watershed projects may be accomplished at non-federal expense but the limitations on the size of drainage areas and the size of impoundments in these projects is such that the quantities of water available at any single location are not sufficient for other than very small urban and rural non-farm communities.

The only authorized study of navigation on the Wabash River is being made on that reach of the stream from Terre Haute to the mouth. The basis for selection of this portion of the river for such a study defies identification since the existing flow of freight extends through Terre Haute, both that which moves northward and that which moves in a southerly direction.

Although hydroelectric power studies are made for each reservoir selected for survey scope study, it is widely recognized that severe limitations exist both on volume of water and on possible developed head of pressure throughout most of the Wabash Valley. Additionally, should hydro-power be developed it would be in direct competition with thermo-power developed from large local reserves of steam coal for which there is now little other usage.

Both the upstream and downstream flood control plans are expected to be highly effective in those areas most directly affected and of lesser benefit to those areas further removed from the reservoir sites. Combined with channel improvement, levee and local protection projects, flood damage reduction will probably be the maximum feasible under present programs.

Land stabilization, watershed protection and management can be accomplished on the majority of the land only to the degree that individual landowners can be convinced that this is essential to continued profitable agricultural production. Land use regulation for purposes of conserving soil and water is a power that Soil and Water Conservation Districts in Illinois have never used and a power which is not available to these Districts in Indiana. Farm drainage practices and irrigation facilities will continue to be constructed on agricultural lands as rapidly as adequate returns from expenditures are forth-

coming. Drainage of "new lands" will continue until there is provision for public control of these lands for non-agricultural use. These presently conducted surveys of upstream areas will provide volumes of information but under present programs both the opportunities for development and acceleration of project accomplishment depend upon increased non-federal participation.

Planning and development of outdoor recreation facilities for water-associated activities will be accomplished on all major reservoirs and on some reservoirs developed in small watershed areas. Outdoor recreation not water-oriented is ignored.

Fish and wildlife management is to be an integral part of Corps project construction; other aspects of development and management of this resource included in the survey plan are the responsibility of the Departments of Conservation of Illinois and Indiana.

Preservation aspects of river basin planning are ignored completely in this plan of survey.

IN REVIEW

WATER SUPPLY AND WATER QUALITY CONTROL

The U. S. Public Health Service, Department of Health, Education and Welfare has the responsibility for providing information on the present and future needs for water for water supply and water for water quality control. This agency is cooperating with the U. S. Army, Corps of Engineers and the Economic Research Service, U. S. Department of Agriculture in establishing projected demands for water to the year 2020.

In making this analysis of water supply needs and the demand for water for water quality control, the Public Health Service is being assisted by:

United States Department of Interior, Geological Survey
State of Illinois Department of Health
State of Illinois Sanitary Water Board
Illinois Department of Mines and Minerals, Division of Oil and Gas
Indiana State Board of Health
Indiana Stream Pollution Control Board
Indiana Flood Control and Water Resources Commission
Indiana Department of Conservation, Geological Survey
Indiana Department of Conservation, Water Resources Division

Judgment of the Plan of Survey indicates a complete analysis of water demands will be made providing "estimates of quantity, location and time" that water needs will be incurred. The identification of these needs will enable planning for construction to meet these needs only if adequate study of the streams, topography and geology of the sub-basins is accomplished.

The Soil Conservation Service, through the study of 540 watershed areas in the Valley, is providing information on possible impoundments in upstream areas. This study will identify the capability

of meeting needs for water through the creation of relatively small reservoirs (a limitation of 5,000 acre-feet is imposed by federal regulation). Studies of potential reservoir sites on the major streams of the Valley are not included in the Plan of Survey except for those sites judged suitable for flood control storage.

The estimates of quantities needed and the location at which these needs occur should be used to identify those reaches of streams in which it is most desirable to obtain water storage capacity to meet these needs. It is true that the ability to move water at minimal cost is an advantage in supplying water to areas removed from adequate storage potential; this does not, however, preclude the responsibility for supplying water for basic needs at the lowest possible cost to the consumer; we must not pre-empt low cost per unit storage sites for flood control and later face the necessity of developing higher cost storage for utilitarian phases of a water management program.

Since responsibility for water supply needs for domestic, industrial and other municipal water uses rests with non-federal interests, studies of the sub-basin to determine the possibility of meeting these needs, efficiently and effectively, should be accomplished by state and local agencies. Many local agencies are incapable of or unwilling to finance such studies, especially in those instances in which provision for future need is paramount; for purposes of planning the state must assume this responsibility.

Responsibility for water quality control is likewise non-federal and must be assumed by state and/or local agencies except in that reach of the Wabash River designated an interstate stream. Thus, providing storage for low-flow augmentation to insure quality control must be accomplished with non-federal funds except in those areas in which low flow water is included as a project purpose in a federally constructed flood control project. Again since flood control reservoir sites are selected and developed primarily as flood control reservoirs, these reservoirs may be used for low flow water storage only if the need for such storage is identified and if storage for quality control purposes does not detract from the use of the reservoir for the primary purpose, flood control. It is necessary to determine the degree to which desirable water quality may thus be obtained and, in those reaches of streams where desirable water quality can not be insured, studies must be conducted to determine what additional storage is necessary and where possible, identify sites which need to be considered for development to provide good quality surface water throughout the Basin. Should it be determined that desirable water quality for specific uses cannot be maintained in certain streams or particular reaches of some streams, there must then be prepared a plan of zoning segments of streams for specific usage.

NAVIGATION

The Commission will cause to be prepared an economic impact study to determine as accurately as possible the effect of a cross-basin waterway upon the economy of the Basin and certain adjoining lands. Such a waterway would connect the Ohio River with Lake Erie through the Wabash and Maumee Rivers and join to Lake

Michigan through a canal intersecting the navigable river system in the vicinity of Lafayette. This economic study would identify the benefits and losses to an area determined to be that which might reasonably be affected and would encompass much more than a study of project feasibility as it might be determined through analysis of competitive freight movement.

WATERSHED PROTECTION

Land stabilization and watershed protection are essential to a water and land development project. In addition to representing a serious and permanent depletion of the soil surface, sediment accumulation in the channels of the streams and rivers of this basin has so reduced channel capacity that it is a significant contributing factor in the increased frequency and severity of flooding. In numerous instances sediment deposition has produced radical and costly changes in stream courses and the siltation of reservoirs results in costly reduction in needed reservoir capacity. The Soil Conservation Service is providing technical assistance to farmers through the local Soil and Water Conservation Districts and the Agricultural Conservation and Stabilization Service provides a program of cost-sharing on conservation practices. Although considerable progress in applying conservation farm practices to the land has been made, there remains a great need for acceleration of this work; responsibility for informing the people and for promoting the conservation of soil and water has been assigned to local Soil and Water Conservation District Boards. The membership of these Boards, by law, must be composed of farm land owners or operators; most of the members are actively employed in farming and serve, without pay, on the District Board assisted only by technically trained personnel who are not permitted to engage directly in promotion of the District program.

In Illinois, direct supervision of the Soil and Water Conservation Districts is centered in the Division of Soil and Water Conservation, Department of Agriculture; in Indiana, the State Soil Conservation Committee has similar responsibilities. These agencies should provide personnel who could present to the farmland owners and operators the benefits and advantages of land stabilization and watershed protection and assist in promoting soil and water conservation through watershed development. It is suggested that each of the above agencies assign one man to assist the Wabash Valley Interstate Commission in accelerating small watershed project development in the Valley.

RECREATION

The work of the Bureau of Outdoor Recreation under the present Plan of Survey is highly unsatisfactory when it is recognized that within this Valley vast improvement in the recreational area per capita ratio is needed. This Bureau, working under contract to the Corps of Engineers, studies only project areas identified by the Corps for "survey scope study." Once the project area and approximate pool levels are established Bureau of Outdoor Recreation personnel estimate the visitor days of anticipated use, placing a dollar value on

this recreational usage, a value which is then used in project evalution. In addition, the Bureau personnel identify certain segments of the project area within which recreation facility development should be achieved, determining the extent of such development in accordance with the previously estimated use.

At present the Bureau of Outdoor Recreation is restricting its survey activity to selected reservoir sites adding to this only an inventory of existing outdoor recreation facilities, an inventory which was completed for the state of Indiana in 1962 by a subcommittee of the Governor's Committee on Recreation.

Not all outdoor recreation is water-based nor even water-associated; further, not all outdoor recreational facilities need to be provided at public expense. The Wabash Valley includes more than 2,800,000 acres of non-agricultural land and an additional 4,000,000 acres of land which is physically unsuited for production of cultivated crops. Considerable acreages of these lands lie in areas which are not highly prosperous and which could profit from development of income producing use of these lands. A review of the potential for commercial development of presently non-productive and marginally productive lands is needed and where possible recommendations for commercial development of these lands should be made.

Through the requirements for administration of Land and Water Conservation Fund grants, planning for public recreation areas is being accomplished by the States of Illinois and Indiana. Indiana already has a master plan for acquisition and development to meet its needs for conservation and recreation lands; Illinois will soon have such a plan available. These plans are based upon projected needs to the year 1975; less detailed, but equally extensive in scope, planning for the next ten years should be initiated by each State at this time. Provisions should be made for the preparation in 1970 for the period 1975-85; these plans should be similar in detail to those for the period 1965-75. Revision of these plans and preparation of plans for each subsequent decade should be prepared at 10 year intervals. A schedule such as this would provide ample overlap in planning and accomplishment to permit realistic reevaluation of plans during the construction period.

With the existence of the State Recreation Plans, further planning of reservoirs should accommodate the recommendations in the respective state plans.

FISH AND WILDLIFE

Although the scope of the Survey Plan proposed by the Fish and Wildlife Service is considerably more comprehensive than is that of the Bureau of Outdoor Recreation it is apparent that most attention is to be directed toward the fishing resource and migratory waterfowl. Historically the federal government has taken little or no interest in the management of upland game birds and/or animals leaving that phase of wildlife resource development to the individual states. It may be recommended that attention be directed to greater use of the proposed project lands for wildlife habitat development

and public hunting especially in those areas of the project which are not within the flood pool and those areas within the flood pool which are seldom, if ever, flooded.

MINERALS

The Bureau of Mines is presently restricting its studies within the Wabash Valley to project areas selected by the Corps of Engineers. The mineral wealth of this Valley represents a significant part of the developed economy, further development hinges upon increased knowledge of the potential mineral resources obtaining information on the reserves including location, quantity, and quality and upon available water for development and utilization. The present study is restricted to some 20 specific locations in the Valley.

GROUND WATER

The ground water resource studies outlined in the Plan of Survey are similarly restricted areally, but a cooperative study by the USGS and the Division of Water Resources, Indiana Department of Conservation is providing valuable information on the availability of this resource. The ground water resource of this Valley represents a considerable and extremely valuable resource and should be explored completely. It is imperative that additional information on the ground water resource in the Illinois portion of the Valley be obtained.

SUB-BASIN STUDIES

The Wabash Valley Interstate Commission requested the Division of Waterways, Illinois Department of Public Works and Buildings, to make a comprehensive study of the water management potential of the Embarrass River Basin. Although not completed, a progress report on this study was presented to the Commission in February, 1965; the Illinois General Assembly has provided an appropriation for continued investigation of the Embarrass Basin. Governor Kerner signed this bill approving the appropriation on May 5, 1965. The progress report on the basin is here presented, not as an alternative to the Lincoln Reservoir proposal but, for comparative consideration with this reservoir proposal; the report provides an opportunity to review a plan for water control and development based upon need and the potential for management throughout the Embarrass Basin. Not presented, but included in the studies of the Embarrass Valley, is a proposed flood control project in the Villa Grove, Illinois area[7] and a channel improvement project for the lower Embarrass River.

A PLAN FOR WATER RESOURCES DEVELOPMENT IN THE EMBARRASS RIVER BASIN[8]

[7]Survey Report for Flood Control, Embarrass River and Tributaries. Villa Grove and Vicinity, Douglas County, Illinois, Division of Waterways, Illinois Department of Public Works and Buildings, Springfield, 1960.

[8]Presented before the Wabash Valley Interstate Commission by John C. Guillou, Chief Waterway Engineer, Division of Waterways. Illinois Department of Public Works and Buildings, Springfield, February, 1965.

THE PLAN

The plan presently studied by the Division of Waterways for water resources development in the Embarrass Basin consists of the following major features: nine major flood retarding basins on tributary creeks, over two thousand small retarding basins in upland areas, a three-reservoir recreational complex, and a 17,000 acre levee district.

Reduction of flood damages will be attained through the regulating effects of artificial storage. This storage, which is located in the retarding basins and as surcharge on the reservoirs, is generally adequate to control the 100 year flood event from each individual watershed. Stage reductions in the lower reaches of the Embarrass River will increase the protection provided by existing levee systems. The proposed 17,000 acre levee district in this area rounds out the flood control features of the plan.

One of the best opportunities for recreational development in the Embarrass Basin is found in the Muddy Creek watershed. The three reservoirs proposed for this area will provide about 9,000 acres of nearly static water surface, many miles of shoreline, and a high quality water.

RETARDING BASINS

A retarding basin is simply a reservoir which is normally dry. The normal stream discharge passes through an outlet in the base of the dam which offers no obstruction to the flow. However, during a flood the reservoir begins to fill and the stream discharge is limited to a tolerable amount by the outlet conduit. Once the storm has passed the reservoir will gradually empty.

Although used in Europe for centuries, the first major application of the retarding basin in this country was in the Miami River Basin in Ohio. This system constructed by the Miami Conservancy District after the disastrous 1913 flood, has proved its effectiveness time and again. Retarding basins are now frequently used by the Soil Conservation Service and many other groups as an effective runoff control measure.

Detailed studies made by the Muskingum River Conservance District showed that retarding basins were not desirable in that watershed because of an adverse effect on flood peak timing as a result of local conditions.

Preliminary studies on the Embarrass indicate that these conditions are not present and that the retarding basin system is applicable. Experience has shown that well planned and designed retarding basins are simple, effective, economical to build and maintain, and relatively fool-proof, because they eliminate the human element in operation.

EAGLE BRANCH LEVEE DISTRICT

The project provides levee protection for 17,000 acres of floodplain lands in Lawrence and Crawford counties. It was originally proposed by Jacob Harmon[9] in 1913 as Levee Unit No. 3 of his plan. Updating of the plan includes a new, modern levee section and pumping plan for interior drainage. This unit protects about 15% of the floodplain lands of the Embarrass Valley.

MUDDY CREEK RECREATIONAL COMPLEX

The plan provides the basic requirements of a very desirable recreational development water area and shoreline. The three contiguous reservoirs develop the maximum potential of the 213 square mile watershed. The two upper reservoirs are relatively narrow and deep with moderate to steep shore slopes. They will help regulate the high and low flows and clarify the water released into the lower reservoir. The lower reservoir is relatively broad and shallow with moderate to shallow shore slopes. The level of this reservoir can be held within narrow limits of fluctuation.

The lower reservoir is best suited for intensive shoreline development and the more active forms of water recreation such as boating, sailing, and water skiing. The water will be clearer and warmer than the upper reservoirs which is desirable for swimming. The moderate to flat shore slopes, although not particularly scenic, are well suited for development of cottage and home sites.

The shorelines of the upper reservoirs have moderate to steep slopes and are generally wooded. The sites are more scenic but not well suited for intensive development. The waters will be cooler but more turbid than the lower reservoir. If improved and maintained in a natural state these reservoirs would be well suited to fishing, hunting, hiking and camping.

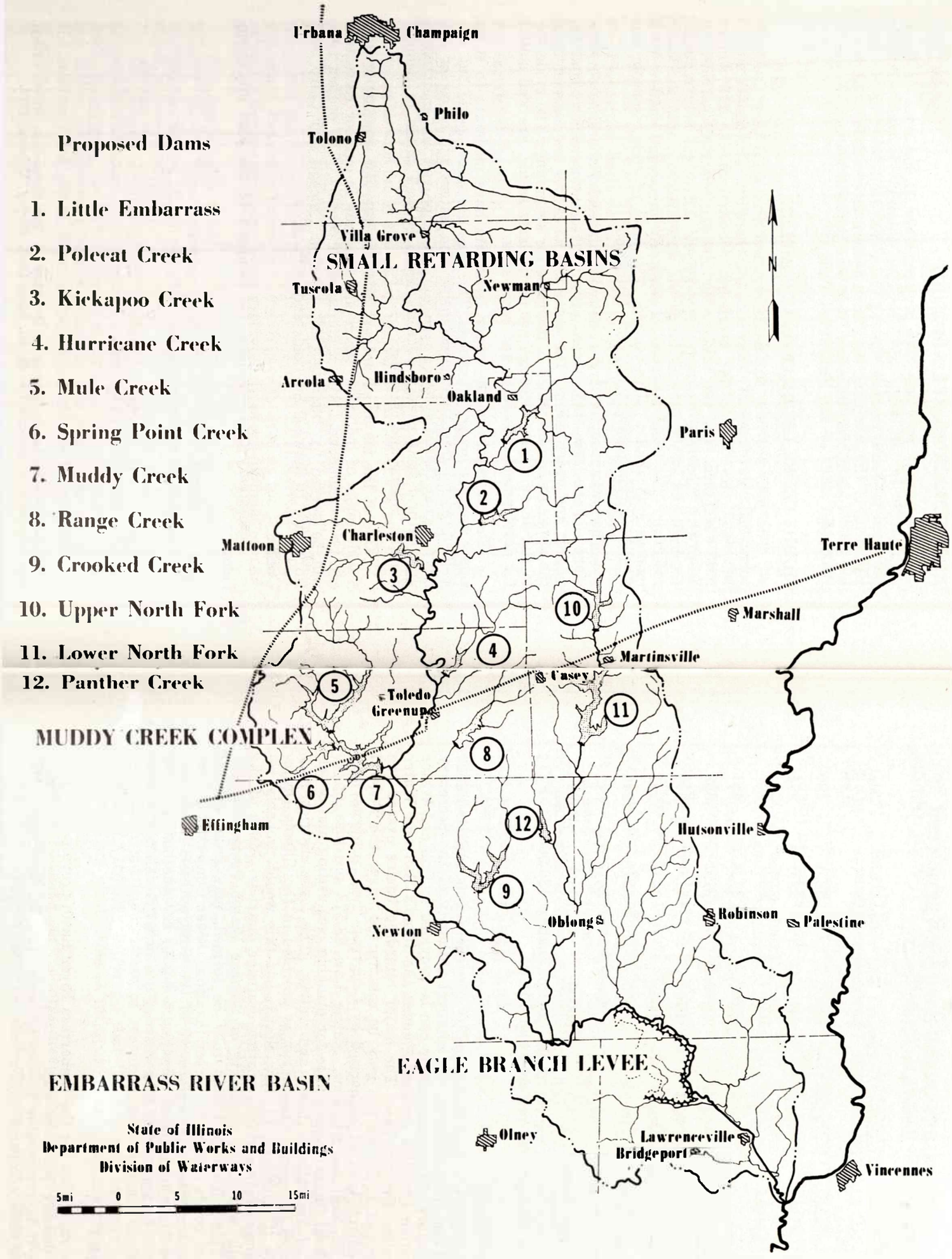
One of the major advantages of three-reservior complex is that a wide range of individual tastes and interests in outdoor recreation can be accommodated with a minimum of conflict. The project area will be served by Interstate 57, between Chicago and Cairo, and Interstate 70 between St. Louis and Indianapolis.

COSTS

Preliminary cost estimates for elements of the plan are given below.

I.	Major retarding basins	$ 5.8 million
II.	Small retarding basins	4.8 million
III.	Levee Unit	1.6 million
IV.	Recreational complex	6.5 million
V.	Total	$18.7 million

[9]**Reclamation of Lands Subject to Overflow in The Embarrass River Valley,** Jacob A. Harmon, Bulletin No. 25, Ill. State Geol. Survey, Urbana, 1913.


Proposed Dams
1. Little Embarrass
2. Polecat Creek
3. Kickapoo Creek
4. Hurricane Creek
5. Mule Creek
6. Spring Point Creek
7. Muddy Creek
8. Range Creek
9. Crooked Creek
10. Upper North Fork
11. Lower North Fork
12. Panther Creek
MUDDY CREEK COMPLEX
Urbana
Champaign
Philo
Tolono
Villa Grove
SMALL RETARDING BASINS
Tuscola
Newman
Arcola
Hindsboro
Oakland
Paris
Mattoon
Charleston
Terre Haute
Marshall
Martinsville
Casey
Toledo
Greenup
Effingham
Hutsonville
Newton
Oblong
Robinson
Palestine
EAGLE BRANCH LEVEE
Olney
Lawrenceville
Bridgeport
Vincennes
N
EMBARRASS RIVER BASIN
State of Illinois
Department of Public Works and Buildings
Division of Waterways
5mi 0 5 10 15mi

SUMMARY OF RETARDING BASINS INVESTIGATED
Embarrass River Report

Name of Basin	Drainage Area (Square Mile)	Storage @5.5" (Acre-Foot)	Cost/AC-FT Dollar	Total Cost ($1,000)
Little Embarrass	43.0	16800	$ 28.0	480
Polecat Creek	17.0	5200	53.0	275
Kickapoo Creek	36.0	10800	86.0	933
Range Creek	43.8	13100	34.0	451
Crooked Creek	74.0	22200	31.0	683
Panther Creek	22.3	6700	51.0	346
North Fork (Upper)	68.6	20600	36.0	741
North Fork (Lower)	82.8	24900	50.0	1240
Hurricane Creek	58.3	17500	40.0	693
Muddy Creek Complex	213.0	60000	105.0	*6290

*Includes cost of permanent pools (approximately 130,000 AC-FT); therefore average cost per acre foot $33.1

FINANCING

The small retarding basins qualify for federal funds under Public Law 566 and are all within the approval authority of the Secretary of Agriculture. Local sponsorship can be provided by Soil and Water Conservation Districts organized under the Illinois Soil and Water Conservation District Law. The major retarding basins exceed the limitations of P. L. 566 but may be constructed under the Federal Flood Control Acts. If authorized by Congress, these projects may require no local contributions. Public Law 88-578 provides up to 50% federal financial assistance for planning, acquisition and development of recreational lands and waters. The levee district may be financed by special assessment as provided in the Illinois Drainage Code (Chapter 42, Ill. Rev. Stat.), but this would probably require reorganization of the existing drainage districts. Much of the work falls within the capability of Surface Water Protection Districts, These districts, should they be formed, may issue general obligation bonds retired by direct taxation. River Conservancy Districts have authority to perform all of the work outlined herein and can raise funds by general obligation bonds or revenue bonds. State funds may be appropriated for district use or as assistance to local authorities.

SUMMARY

The study plan for the Embarrass River Basin provides for flood control damage reduction and recreational development. In these respects it is comparable to the proposed Lincoln Reservoir. The following table compares major features of both plans.

COMPARISON OF MAJOR FEATURES OF LINCOLN RESERVOIR WITH DIVISION OF WATERWAYS PLAN

		Lincoln Res.	DOW Plan
1.	Total project lands required	38,800 acres	23,000 acres
2.	Lands permanently inundated	7,000 acres	9,000 acres
3.	Joint use lands	28,500 acres	14,000 acres
4.	Drainage area controlled by major impoundments	915 sq. mi.	828 sq. mi.
5.	Flood control storage converted to inches on 2260 sq. mi.	4.0 inches	3.75 inches
6.	Flood plain lands to be benefited	80,000 acres	115,000 acres
7.	Cost of Flood Control	$18.6 million	$14.2 million
8.	Cost per acre benefited	$232	$123
9.	Low flow augmentation and future water supply	7 MGD	None
10.	Recreation areas: A. Water	7,000 acres	9,000 acres
	B. Land	31,800 acres	14,000 acres
11.	Costs over and above flood control	$13.4 million	$4.5 million
12.	Total Costs	$32.0 million	$18.7 million

CONCLUSION

If the Commission accepts as an objective of river basin planning the statement, "the overriding determinant in considering the best use of these resources shall be the well-being of all people", it is not possible for the Commission to continue to accept the preparation of interim reports on flood control reservoirs and subsequent Congressional authorization for construction of these reservoirs unless it can be conclusively illustrated that such construction does not deprive certain segments of the population of the Basin of storage capacity which may be needed for utilitarian phases of the water management program.

Because the Governor of Illinois and the Governor of Indiana must approve proposed federal projects in their respective states and, because specific agencies in these states have been assigned responsibilities in particular areas of resources development, these state agencies are required to certify that the proposed projects are desirable and are identifiable as integral segments of a state plan for development.

Recognizing the political pressures applied by various groups for particular projects or for projects in certain locations, it is admittedly difficult to envision project accomplishment in a comprehensive

plan, yet this Commission is charged with the responsibility for formulating a comprehensive plan for resource development and therefore must, in evaluating project proposals, disregard all influences except the basic principles of planning. The Division of Waterways of the Illinois Department of Public Works and Buildings is conducting comprehensive studies of water development in each of the sub-basins in Illinois; similar studies of the sub-basins in Indiana should be made by the Indiana Flood Control and Water Resources Commission. These studies must be correlated with those made by the Corps of Engineers, the Soil Conservation Service and the Public Health Service so that there may be comparable bases for evaluation of the recommendations of each agency. If political expediency is to be served, it must be accommodated through selection of acceptable projects within the plan not as isolated projects selected prior to completion of the plan for any one sub-basin.

If water supply and water quality control are accepted as basic needs in a water management program, these elements of demand must be served first in the allocation of storage. Should it be determined that all available storage is required to serve these purposes, other water needs and water control measures must be satisfied without utilizing potential water storage sites.

Comprehensive planning for water development in the Wabash Valley hinges upon these further studies.

1. The U. S. Public Health Service, in cooperation with other agencies is preparing a report of water supply needs and water quality control needs. Water storage allocation to meet these needs is the responsibility of the Illinois Division of Waterways and the Indiana Flood Control and Water Resources Commission with the assistance of the Illinois Department of Public Health, the Illinois Sanitary Water Board and the Illinois Water Survey; the Indiana State Board of Health, the Indiana Stream Pollution Control Board, the Division of Water Resources of the Indiana Department of Conservation. Such storage allocation is obtained through evaluation of potential storage sites identified by the Corps of Engineers, the Soil Conservation Service and the responsible state agencies. Storage available in these sites in excess of that required for water supply and water quality control may be allocated for other purposes.

2. Irrigation water storage is not likely to require a large reservoir capacity in a region which normally receives 35-40 inches of rain annually and storage for this purpose must be restricted to reservoir sites in those areas having soils suitable for irrigating.

3. Navigation through the Wabash Valley, as proposed, will require large quantities of water or the installation of mechanical lifts at main channel dams. At least one study of a navigation system for this basin has indicated a sparsity of water for adequate operation. Design, construction and operation of those storage sites used for flood control should be analyzed as source areas for needed navigation water.

4. Flood control is a non-utilitarian phase of the water management program. In an area such as the Wabash Valley where there are relatively few locations suitable for water storage, flood control should be obtained using the fewest possible reservoir sites. Channel improvement and levee construction must be used wherever possible with flood water storage in reservoirs identified as that storage available which is not needed for other purposes. This, perhaps indicates a progressive program of construction in a particular valley having immediate and near future water needs satisfied by storage allocation with the remaining capacity available for flood water storage. As the demand for water increases with future needs, reservoir capacity previously used for flood water storage would then be allocated for water use storage and the additional flood protection obtained through downstream improvements in channels and levees.

5. Fish and wildlife conservation should be a part of every water development project with the management of these resources varied in accordance with the primary operation of the project.

6. The development of recreational water uses may be a secondary value to be achieved in association with all water development projects. Yet there are certain advantages for recreational development which either cannot be obtained or can be more effectively obtained in water development specifically for recreational purposes. Certain areas of peculiar advantage should be developed primarily for recreation; these may be scenic areas easily accessible, areas of particular scenic beauty, areas in which the development of recreation as a basic element of the economy is desirable or areas of exceptional demand for water-associated recreation not otherwise available.

7. Land stabilization including stream bank stabilization is basic to all water development programs and should be accomplished prior to construction of reservoirs, channel improvements and other projects which alter the flow of water. Land stabilization, watershed protection and upstream water control must be accomplished on every acre of land in the watershed and justification of projects to obtain such control must not be jeopardized in any way by prior or planned construction.

8. Improvement of drainage on both agricultural lands and in built up areas must be accomplished as rapidly as possible, however, the drainage of new lands, lands not now in crop production, for the purpose of obtaining additional cultivable acres must be restricted. The ability to over produce food and fiber crops and the need for "wet lands" for recreation and wildlife conservation must be considered in any program designed to drain lands not now in productive use. Before new lands may be drained, public agencies should be given the opportunity of acquiring the use of these lands. This can easily be done in Indiana, requiring the newly established county

drainage boards to identify these lands and instituting a policy of issuing permits for drainage work as permits are now issued for levee construction. In Illinois the land-use regulatory powers of the Soil and Water Conservation District Boards could be utilized in accomplishing this control over new drainage projects.

RESPONSIBILITIES OF STATE AGENCIES IN THE COMPREHENSIVE SURVEY OF WATER AND RELATED LAND RESOURCES

1. Illinois Division of Waterways, It shall be the responsibility of this agency to prepare or cause to be prepared a comprehensive plan for water development in each of the sub-basins of the Wabash Valley in Illinois — the basin of the Vermilion Rivers, the Embarrass Basin, the Little Wabash Basin and the Skillet Fork Basin. The Illinois General Assembly has appropriated funds for the completion of these reports. Such plans shall be used to evaluate the recommendations of the Corps of Engineers and the Soil Conservation Service as presented in the interim reports and in the joint report anticipated as the Final Report of the presently conducted survey; these reports should be judged to determine the extent to which the needs of the state are provided in the recommended federal agency projects.

2. The Indiana Flood Control and Water Resources Commission. It shall be the responsibility of this agency to prepare or cause to be prepared a comprehensive plan for water development in each of the sub-basins of the Wabash Valley in Indiana — the Patoka Basin, the Lower White, — East Fork, the Upper White — East Fork, the Muscatatuck, the Lower White — West Fork, the Upper White — West Fork, the Mid-Wabash, the Upper Wabash and the Tippecanoe. Such plans shall be similarly used in the evaluation of project proposals.

3. The two above mentioned agencies shall work cooperatively in the Lower Wabash Basin which includes land in each of the two states, mutually agreeing as to which of the two agencies has responsibility for preparation of the report. Small watersheds draining directly into the Wabash River shall be the responsibility of the agency in that state in which the majority of the land in the watershed is located.

4. The Illinois Department of Public Health and the Illinois Sanitary Water Board in addition to cooperating with the U. S. Public Health Service in its study of water supply and water quality control needs shall identify the needs by sub-basins for the Illinois Division of Waterways for use in its study of control measures to provide for these needs. If the Sanitary Water Board is to be responsible for water quality control, there must be no distinction between pollutants or sources of pollution as they may affect the surface and/or under-

ground waters. Legislative action to place control of mine wastes, oil field wastes and other waste emanating from areas and operations effecting mineral recovery under the jurisdiction of the Sanitary Water Board must be obtained.

5. The State Board of Health and the Stream Pollution Control Board in Indiana must serve a similar function in that portion of the Wabash Valley which lies in Indiana.

6. These agencies in the two states must cooperate to obtain adequate water supply and water quality control in those areas where drainage lines cross the common boundary of the states. Further, interstate cooperative effort by the Illinois Sanitary Water Board and the Indiana Stream Pollution Control Board must result in common standards for water quality in the Wabash Basin.

7. Regulatory powers of these two agencies apparently are adequate with the exception of mineral wastes control in Illinois mentioned above. Pollution of surface and sub-surface water exists largely because of the inadequacy of policing activities possible under present budgets and staffing. Provision of adequate personnel should result in obtaining highly satisfactory water quality conditions in most of the Wabash Basin.

8. The Illinois Water Survey as a research agency and the Water Research center located at the University of Illinois must be provided the opportunity to review all recommendations and proposals for water development submitting to the Governor reports approving or disapproving these proposals based upon technical evaluation and determination of the desirability of specific projects as integral units of an overall plan.

9. A Water Research Center for the State of Indiana must be established as a cooperative effort of Purdue University and Indiana University to perform the same services as identified above for the State of Illinois.

10. The Illinois Geological Survey must be provided the opportunity of reviewing water management plans and project proposals to determine the relationship of these recommendations to mineral development in the State and to the availability of ground water resources. Early participation in the formulation of water resource development plans by this Survey is essential.

11. The State Geologist of the Indiana Department of Conservation should perform an identical function for the State of Indiana.

12. The Departments of Conservation in Illinois and Indiana are preparing statewide plans for future conservation and recreation development. To the degree possible and desirable the recommendations of these plans should be fulfilled through joint state-federal participation in project development. This will require a more effective coordination of effort, keeping all interested agencies informed, and as participants, in initiating planning and in developing these projects.

13. The Division of Soil and Water Conservation, Illinois Department of Agriculture has been given the duty of providing assistance to directors of soil and water conservation districts in carrying out district programs. There is an urgent need to accelerate small watershed project development in the Wabash Basin in Illinois; the Department of Agriculture has been contacted relative to a request for one man on the Department staff to be assigned to assist the Wabash Valley Interstate Commission in an effort to inform people concerning the small watershed program and to assist local groups in such project development.
14. The State Soil Conservation Committee should serve a similar function in Indiana.
15. The Cooperative Extension Service in both Illinois and Indiana employs local representatives in each county. The Farm Adviser (County Agent in Indiana) should assume an active role in the information program to encourage soil and water conservation through the small watershed program. Although this is one of many tasks assigned to these men, a state policy directing the county extension staff to devote a percentage of time to this phase of the county program is extremely desirable.
16. Although the State Committees (Indiana and Illinois) of the Agricultural Stabilization and Conservation Service have in recent years attempted to encourage the use of Agricultural Conservation Program Funds for permanent practice application in this cost-sharing program, local county Agricultural Stabilization and Conservation Service Committees have continued to expend the majority of these funds for limestone and rock phosphate application. Unless other more desirable action can be taken, it is recommended that the State Committees assume responsibility for designating funds for use only for the application of permanent type soil and water conservation farm practices.
17. At the present time there are available to local groups numerous possible legal organizations to provide opportunity for participation in the solution of water problems, drainage districts, conservancy districts, levee districts, etc. . . . There is, however, no single local district organization that can perform all functions necessary to accomplish a complete water development program in a drainage basin. If total water development is to be achieved it must be accomplished basin by basin, there must, therefore, be legislation which will permit the establishment of water development districts with powers and duties to achieve complete control and development of surface and sub-surface waters within the confines of the district created.
18. Total water development cannot be achieved on a locally restricted concept of need, the state has an interest in and a responsibility for all water development. It is highly desirable that a state administered water development fund be established for the purpose of providing financial assistance to local groups for water development.